Unit 3

Straw Management in Paddy

Introduction

Paddy straw is a by-product of paddy crop obtained after the separation of grains from the plant by threshing manually or mechanically with the help of threshers or combine harvesters. The yield of paddy straw depends on varieties, cutting height, and so on. Collection and utilisation of paddy straw is still a major challenge in the paddy straw supply chain. This straw is largely burnt *in situ*, piled or spread in the field, incorporated in the soil or used as mulch or simply carried away from the field for use in livestock paddock. The straw is also utilised as feed stock for different industries.

Characteristics of Paddy Straw

Uncompressed paddy straw has specific weight of 70–80 kg/m^3 at a moisture content of 15–18 per cent. Rice husk contains high amount of silica, which creates hindrance in processing machines (conveyers or grinders). For the same reason, it does not qualify as a quality feed as its digestibility in livestock is hampered without pre-conditioning.

C:N Ratio of Paddy Straw

C:N ratio is defined as the ratio of percentage of Carbon to that of Nitrogen in an organic material. The C:N ratio of dry paddy straw is 60:1 to 80:1 as against the required or recommended range from 10:1 to 25:1. Decomposed paddy straw may not be conducive to crop growth. Therefore, farmers often burn it in the field.

NOTES

METHODS OF PADDY STRAW MANAGEMENT

Paddy straw is commonly used for bedding purpose in paddocks. It is not considered fit for animal feed. It is either dumped into rivers or burnt in the field. This causes contamination of water and air with greenhouse gas emissions. Therefore, paddy straw burning is banned in some countries. However, several technologies have been developed to utilise paddy straw, which are described as follows.

Burning

Burning of paddy straw in field dispenses the effort or labour required to remove large quantity of straw piled in from the field. It is assumed that burning paddy straw in the field helps to control weed, insects–pests and diseases. But burning of paddy causes an adverse impact on soil health like depletion of organic matter and environment. Besides, it poses a threat to beneficial soil microorganisms. Burning of paddy straw is also known to emit harmful greenhouse gases like Carbon dioxide (CO_2) and pollutants like Sulfur dioxide (SO_2), Nitric oxide (NO), etc.

Use as manure

Incorporation of paddy straw is not practised by farmers because it may not get decomposed completely within three to four weeks. Microorganisms like *Tricoderma* have been identified to speed up paddy straw decomposition rate. Cutting up of paddy straw by dry chopper is said to achieve faster decomposition with the help of inoculums. Paddy straw, however, is now finding wide application as a growing medium for mushroom cultivation. The waste paddy straw from animal bedding further finds use as raw material for making compost or manure for crop production.

Compost making

Compost brings organic matter to such a form, which provides required nutrients to the crop, and simultaneously, maintains soil health. For the preparation of compost, paddy straw is chopped and soaked in 0.1 per cent urea solution. The moisture level is maintained at 60 per cent. To this, slurry straw is added from a biogas plant and an equal amount of chopped green matter of some leguminous plant is laid, which covers a layer of 15 cm. The already prepared pit, is, finally, covered with a plastic sheet. Turning the compost material during the period of decomposition is necessary to maintain the temperature and oxygen level. This exercise must be done at an interval of every two weeks. After 90 days of composting, the compost is ready for use. In case, turning is not done, the temperature of the pit will rise, which is not favourable for microorganisms.

Paddy straw bailing

Transferring paddy straw from the field to the location of its use is a major challenge because of its voluminous nature. Paddy straw can be compressed and made compact as rolled up bales. A machine called 'baler' is used to make straw bales (Fig. 3.1). Once baled, the straw is amenable to be easily transferred, leading to reduction in the transportation cost. However, in the present scenario, combine harvesting is more prevalent. The straw remaining after combine harvesting is not easy to bale.

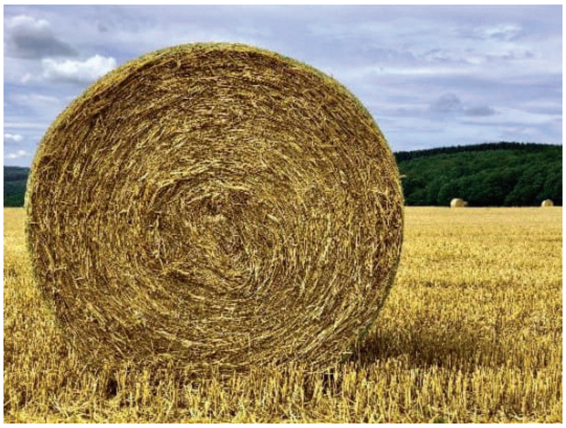

Fig. 3.1: Rice straw bales

INDUSTRIAL USES OF PADDY STRAW

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Paper making

Any lingo-cellulosic material can be used as feed stock for paper and pulp industry. Paddy straw is also a lingo-cellulosic material. Therefore, it can be used for paper making. Paddy straw can be easily pulped and is less harsh for cooking as it contains less lignin as compared to wood pulp.

Biomass to produce energy

Paddy straw can also be used to prepare a briquette and as fuel in a brick kiln. It can be used to generate energy either alone or after being mixed with some other biomass, having high methane producing capacity, thereby, enhancing its energy producing efficiency.

Packing material

High silicon content and resistance to crushing makes paddy straw a desirable material for packaging. Paddy straw provides an environment friendly option for packing. It can also be used as filling material and serve as an alternate to thermocol, plastic, etc. Straw mat and envelopes for wine bottles can also be made out of paddy straw. It can be used for making disposable food packages as well.

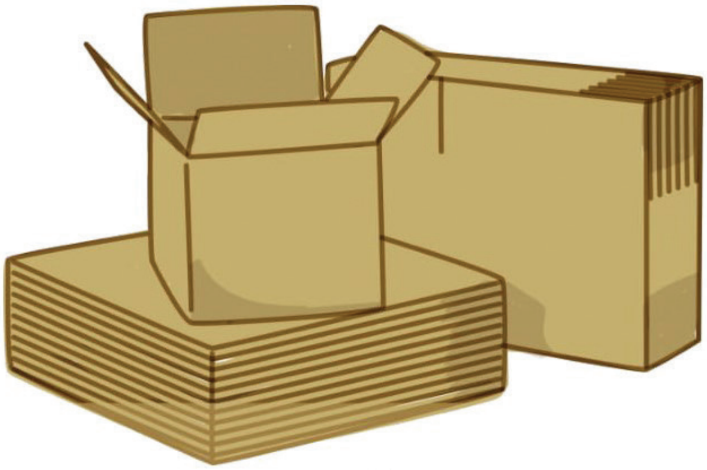

Fig. 3.2: Paddy straw as a packing material

Mushroom cultivation

Paddy straw has high utility as a medium for growing mushrooms in winters or under controlled temperature control conditions. Paddy straw mushroom (*Volvariella volvacea*) and Oyster mushroom (*Pleurotus spp.*) are delicious, as well as, nutritive.

Ropes

The presence of high fibre and mineral content gives tensile strength to paddy straw, making it suitable for making ropes. Ropes made of paddy straw are commonly used in thatch work, packaging industry and iron foundries.

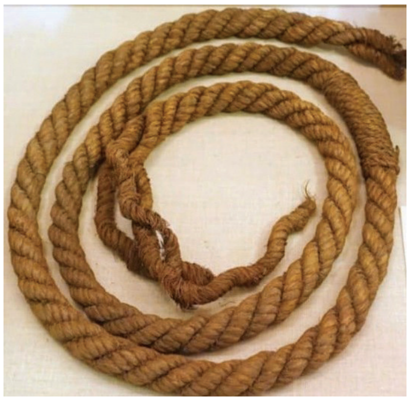

Fig. 3.3: Paddy straw rope

Practical Exercise

Activity

Enlist the various uses of paddy straw.

Material required: writing material and chart paper

Procedure

- Collect information about varrious uses of paddy straw from the Internet.
- Write about various products that can be made with paddy straw.
- Now, give a presentation before the class.
- Allow feedback and discussion on the topic.

Check Your Progress

Notes

A. Fill in the Blanks

1. A by-product of paddy obtained after the separation of grains from plants by threshing is called the ____________.
2. Rice husk contains a high amount of ___________, which creates hindrance in processing machines.
3. Fungal inoculums called ___________ are used to speed up the decomposition of paddy straw.
4. The process of collecting and bundling of paddy straw is known as ____________.
5. The machine used for making straw bales is called a ______________.

B. Multiple Choice Questions

1. Burning of paddy straw emits ____________ greenhouse gas(es).
   (a) CO_2
   (b) SO_2
   (c) NO_2
   (d) All of the above
2. Paddy straw compost becomes ready for use after _____________ days.
   (a) 120
   (b) 90
   (c) 60
   (d) 30
3. What is the C:N ratio of dry paddy straw?
   (a) 20:1 to 30:1
   (b) 40:1 to 50:1
   (c) 60:1 to 80:1
   (d) 90:1 to 100:1

C. Subjective Questions

1. Describe the methods of paddy straw management.
2. Write the process of paddy straw compost preparation.
3. Explain the uses of paddy straw.

D. Match the Columns

A	B
1. Paddy straw rope	(a) *Volvariella volvacea*
2. Paddy straw mushroom	(b) Paper and pulp industry
3. Lingo-cellulosic material	(c) *Pleurotus spp.*
4. Oyster mushroom	(d) Thatch work